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10/643,974	08/20/2003	Wu Mei	241786US2SRD	4968
22850 7590 06/11/2009 OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314				
EXAMINER				
LEE, CYNTHIA K				
ART UNIT		PAPER NUMBER		
1795				
NOTIFICATION DATE		DELIVERY MODE		
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/643,974

Applicant(s)

MEI ET AL.

Examiner

CYNTHIA LEE

Art Unit

1795

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 March 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-7 and 20-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-7 and 20-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-8508)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/23/2009 has been entered.

Response to Arguments

This Office Action is responsive to the amendment filed on 2/23/2009. Claims 1, 3-7 and 20-33 are pending. Applicant's prior art arguments have been considered but are not persuasive. Claims 1, 3-7 and 20-33 are non-finally rejected for reasons stated herein below.

The 35 USC 112, 1st rejection has been withdrawn because the arguments were found persuasive.

Claims Analysis

The limitation "fuel cell" in the preamble of claim 1 was considered but has not been given patentable weight because it has been held that a preamble is denied the effect of a limitation where the claim is drawn to a structure and the portion of the claim following the preamble is a self-contained description of the structure not depending for completeness upon the introductory clause. See MPEP 2111.02.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-7 and 20-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamauchi (JP 2002-226926) in view of Tsumura (US 2002/0015878).

Yamauchi discloses a catalyst material comprising chemical compounds X, Y, and Z. X (applicant's T) comprises Ti, Zr, Al, Fe, Cr, Mo, V, and Si. Y (Applicant's A) comprises Pt, Ag, Au, Cu, Ni, Pd, Co, Cr, Mo, W, Ti, Zr. The metallic elements are treated with a gaseous phase of ammonia (NH₃) at an elevated temperature [0012]. Yamauchi discloses embodiments in which the elevated temperature range includes from ~500C to ~1500C. See Examples 1-3.

The X falls within the range between 0.0001 atom% and 70 atom% [0008] (applicant's claim 5). Should it not be disclosed with sufficient specificity, Yamauchi discloses that the function of the generated compound becomes remarkable when carrying out the addition of X of the solid more than 0.0001 atom%. However, if the addition of a metallic element X exceeds 70 atom%, it will become difficult to distribute a functional compound particle in a matrix [0008], thus clearly teaching that the atomic ratio of X is a result effective variable. It has been held by the courts that discovering an optimum value or workable ranges of a result-effective variable involves only routine

skill in the art, and thus not novel. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See MPEP 2144.05.

Example 5 [0027, 0028] discloses a Cu-Al solution that was held at 800 C in NH₃ atmosphere in 1 atm for 2 hours. It resulted in fine particles that are homogeneously dispersed, in which includes AlN dispersed in Cu matrix. Likewise, it would have been obvious to one of ordinary skill in the art at the time the invention was made to mix any one of X and Y compounds under the same experimental conditions as Example 5.

The Examiner notes that in the instant Specification pg. 15 lines 14-17 that nitriding is performed at a temperature of 200 C to 1000 C for 0.05 to 100 hours in a gas atmosphere containing NH₃ with a partial pressure of 0.05 atmospheres or more.

Yamauchi must necessarily possess platinum-containing nitride particles because particles of Yamauchi are prepared by the method of the claims as supported in the Specification. The burden has been shifted to the applicant to show obvious difference between the claimed product and the prior art product. *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983). It is noted that if the applicant intends to rely on Examples in the specification or in a submitted declaration to show non-obviousness, the applicant should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with the Yamauchi.

Yamauchi does not disclose the average diameter of the catalyst particles. However, Tsumura teaches that in conventional electrodes, a metal belonging to the platinum group is supported on a carbon and is used as a catalyst metal. The activity of

such an electrode highly depends on the surface area of the catalyst metal. It can therefore be thought that catalytic activity may be enhanced by reducing the particle diameter of the catalyst metal to increase surface area per unit weight. However, it has been reported that as the particle diameter of the catalyst metal belonging to the platinum group decreases to below the range of 2.5 to 3.5 nm, the catalytic activity of the metal per unit weight decreases due to the particle size effect (see K. Kinoshita, J. Electrochem. Soc., 137, 845 (1990)). Consequently, the catalyst metals currently used are a platinum-group metal having a mean particle diameter of about from 2.5 to 4 nm and highly dispersedly supported on carbon particles. In order for such conventional electrodes to have sufficient properties in practical use as a cathode or an anode, the amount of the platinum-group metal supported on the cathode or the anode should be as large as 0.4 mg/cm.² or higher or 0.1 mg/cm.² or higher, respectively. In contrast, the electrodes of the invention are free from the particle size effect and show high activity even when the catalyst particle diameter is 1.5 nm or lower, preferably from 0.5 to 1.5 nm [0055]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the particle size of Yamauchi for the benefit of enhancing the catalytic activity. Tsumura clearly teaches that the particle diameter is a result effective variable. It has been held by the courts that discovering an optimum value or workable ranges of a result-effective variable involves only routine skill in the art, and thus not novel. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See MPEP 2144.05.

Yamauchi does not disclose a membrane electrode assembly (applicant's claim 6) or a fuel cell (applicant's claim 7) with catalytic layer as claimed by the applicants. However, Tsumura teaches a membrane electrode assembly comprising a solid polymer electrolyte film and a cathode and anode supported by collectors ([0077] and fig 2). To make an electrode, a mixture of carbon particles and cation-exchange resin was formed. The mixture was mixed in an aqueous solution of platinum [0079, 0080] (applicant's claims 6 and 7). Although the catalyst metal may be an elemental metal belonging to the platinum group, it is preferably an alloy comprising one or more elements belonging to the platinum group. More preferably, the catalyst metal comprises platinum element and ruthenium element. Use of a catalyst metal comprising a metal element belonging to the platinum group is preferred in that this catalyst metal has high catalytic activity in electrochemical oxygen reduction reaction and hydrogen oxidation reaction. Furthermore, use of a catalyst metal comprising platinum element and ruthenium element is effective in giving an electrode which, when used in a fuel cell employing a reforming gas containing a slight amount of CO, is highly inhibited from being influenced by the CO [0026]. Furthermore, the catalyst metal preferably contains, in addition to platinum-group metals, at least one element selected from the group consisting of magnesium, aluminum, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, silver, and tungsten. This catalyst metal is advantageous in that the amount of a platinum-group metal used can be lowered and the catalyst metal can have satisfactory CO tolerance and high activity in oxygen reduction reaction [0027]. It would have been obvious to one of ordinary skill in the art

at the time the invention was made to use Yamauchi's catalyst particles in a fuel cell such as of Tsumura for the benefit of using the catalyst of Yamauchi to generate electricity.

Further, Yamauchi discloses that this material is a hydrogen adsorption material [0033]. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use Yamauchi's catalytic material in membrane electrode assemblies and fuel cells for the benefit of catalyzing hydrogen gas in the anode.

Regarding the limitation "the platinum-containing nitride particles including a platinum nitride-based nano-material", it is noted that all material possesses nano-scale material when observed on a microscopic level.

Claims 1, 3-7 and 20-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 4794054) in view of Tsumura (US 2002/0015878).

Ito discloses a fuel cell with a membrane electrode assembly comprising a platinum catalyst with Co and Fe with an atomic ratio of 2:1:1 (5:15-20) or 40 to 80% pt, 10 to 40% Fe, and 10 to 40% Co (2:10-20). The catalyst is supported on a particulate carbonaceous carrier (2:40-50, 65-67) (Applicant's claims 21 and 22). Coprecipitation method was used to make the catalyst particles (5:1-20).

The solid particles are dried at 95 C in nitrogen atmosphere and then heat treated at 900 C for 1 hr in a nitrogen stream (5:15-20). The instant Specification states that nitriding was performed between 200 C and 1000 C for 0.05 to 100 hrs (pg 15, lines 15-20). Ito must necessarily possess platinum-containing nitride particles because

particles of Ito are prepared by the method of the claims as supported in the Specification. The burden has been shifted to the applicant to show obvious difference between the claimed product and the prior art product. *In re Marosi*, 218 USPQ 289 (Fed. Cir. 1983). It is noted that if the applicant intends to rely on Examples in the specification or in a submitted declaration to show non-obviousness, the applicant should clearly state how the Examples of the present invention are commensurate in scope with the claims and how the Comparative Examples are commensurate in scope with the Ito.

Ito does not disclose the average diameter of the catalyst particles. However, Tsumura teaches that in conventional electrodes, a metal belonging to the platinum group is supported on a carbon and is used as a catalyst metal. The activity of such an electrode highly depends on the surface area of the catalyst metal. It can therefore be thought that catalytic activity may be enhanced by reducing the particle diameter of the catalyst metal to increase surface area per unit weight. However, it has been reported that as the particle diameter of the catalyst metal belonging to the platinum group decreases to below the range of 2.5 to 3.5 nm, the catalytic activity of the metal per unit weight decreases due to the particle size effect (see K. Kinoshita, J. Electrochem. Soc., 137, 845 (1990)). Consequently, the catalyst metals currently used are a platinum-group metal having a mean particle diameter of about from 2.5 to 4 nm and highly dispersedly supported on carbon particles. In order for such conventional electrodes to have sufficient properties in practical use as a cathode or an anode, the amount of the platinum-group metal supported on the cathode or the anode should be

as large as 0.4 mg/cm.² or higher or 0.1 mg/cm.² or higher, respectively. In contrast, the electrodes of the invention are free from the particle size effect and show high activity even when the catalyst particle diameter is 1.5 nm or lower, preferably from 0.5 to 1.5 nm [0055]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the particle size of Ito for the benefit of enhancing the catalytic activity. Tsumura clearly teaches that the particle diameter is a result effective variable. It has been held by the courts that discovering an optimum value or workable ranges of a result-effective variable involves only routine skill in the art, and thus not novel. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). See MPEP 2144.05.

Ito discloses a fuel cell, but does not disclose current collectors. Tsumura teaches a membrane electrode assembly comprising a solid polymer electrolyte film and a cathode and anode supported by collectors ([0077] and fig 2). It would have been obvious to one of ordinary skill in the art at the time the invention was made to add current collectors to the fuel cell of Ito for the benefit of connecting the individual membrane electrode assemblies.

Response to Arguments

Applicant's arguments and the Declaration filed 2/23/2009 have been fully considered.

Applicant argues that the methods taught in Yamauchi of rapid cooling or cooling in a weightless state cannot produce the particle size a claimed. The methods used by

Yamauchi including twin-roll method, pneumatic atomization, and free-fall method cannot produce the particle size as claimed. Applicant supports this argument by the Declaration submitted on 2/23/2009.

The Examiner respectfully disagrees. The instant Specification states that "First, a catalyst precursor containing ultrafine Pt-containing particles is formed. A method of forming the ultrafine particles can be any of a solid phase reaction method, solid phase-vapor phase reaction method, liquid phase method, and vapor phase method." Pg 14, lines 8-11. It is concluded that any method of making would produce the particle size as claimed. However, the Declaration submitted on 2/23/2009 states otherwise. The discrepancy between the instant Specification pg 14, lines 8-11 and the Declaration submitted on 2/23/2009 would have to be resolved before finding the Declaration persuasive.

Regardless, it is noted that Ito (US 4794054) enables the making of the catalyst particles of Yamauchi of the size as claimed because it uses coprecipitation method, as also used by the Applicants (instant Specification pg 14, line 15).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cynthia Lee whose telephone number is 571-272-8699. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Cynthia Lee/
Examiner, Art Unit 1795

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